Appl. No.: 10/707,642
Amdt. Dated: 10/18/2005
Reply to Office action of: 09/22/2005

AMENDMENTSTOTHEDRAWINGS:

There are no drawing amendments presented herewith.

REMARKS/ARGUMENTS

In the specification, paragraphs [0012], [0016], and [0017] have been amended to correct minor editorial problems.

Claims 1 – 8 remain in this application. Claim 1 has been amended to overcome the Examiner's objection and 35 U.S.C. § 112 rejection. Claims 4 and 5 have been amended to correct editorial problems. Support for the amendments to Claim 1 may be found, for example, in paragraph [0016].

No new matter has been introduced by these amendments herein presented.

Claim 1 was objected to by the Examiner for the phrase "said fuse" not having proper antecedent basis. By this amendment Claim 1 has been amended to replace the objected to phrase with the phrase "said current breaking device" suggested by the Examiner and supported in paragraph [0016] of the specification. In light of this amendment the objection is overcome and appropriate action by the Examiner is respectfully solicited.

Claim 1 was rejected under 35 U.S.C. paragraph 112 as being indefinite for using the term "provoking". By this amendment the indefinite term has been replaced by a definite term "causing". In light of this amendment to Claim 1 this rejection is now moot and Applicant respectfully requests removal of said rejection.

Claims 1 – 6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Maxwell, JR. et al. (US 6816758) in view of Frey et al. (US 2004/0174648). Specifically, the Examiner states:

> With regard to Claim 1, Maxwell, JR et al. teaches an active safety circuit with loads (14), protected by solid state switches (20), of the type wherein a load or a group of loads is fed through at least one solid state relay controlled in turn from a unit such as a microcontroller (28) prepared for provoking the opening of said relay, which is at least one, in case an anomaly occurs in said loads (column 2 lines 66 – 67 & column 3 lines 1 – 8), characterized by comprising a set of at least one temperature detector (34) associated to said solid state relay, which is at least one, and connected to said microcontroller such that the latter sequentially checks the state of said temperature detector (column 9 lines 30 – 38), to open if an anomaly in

temperature is produced, the corresponding solid state relay (column 5 lines 26 – 34).

Maxwell JR. et al. does not teach a current breaking device inserted in the power supply network of said solid state relay, which is at least one, a grounded shunt line from one point of said supply network, placed between said fuse and said solid state relay, and a safety switch controlled by said microcontroller and inserted in said grounded shunt line.

Frey et al., in Figure 1, teaches an active safety circuit, comprising; a current breaking device 9110 inserted in the power supply network of a load protective resistor (8), a ground shunt line placed between the circuit breaking device and load protective resistor, and a shunt device (21), controlled by a temperature sensor (28), which measures the temperature of the protectiveresistor(paragraph0013). Frey et al. further teaches the closing of the shunt device if the temperature of the protective resistor exceeds a maximum limit. This short-circuits the grounded shunt line, which actuates the breaking device, and disconnects the protective resistor and load from the power source (paragraphs 0009 & 0013).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Maxwell Jr. et al. with Frey et al. by including the crowbar circuit when monitoring the temperature of a solid state switch and using a microcontroller to trigger the shunt device for the purpose of preventing thermal damage of a solid state relay and further reducing the voltage across the heated relay which could cause additional damage.

With regard to Claim 2, Maxwell JR. et al., further discloses a safety circuit characterized in that the solid-state relay is a FET switch controlled by said microcontroller. (column 2 lines 46 – 53).

With regard to Claim 3, Frey et al. further discloses a safety circuit characterized in that said breaking device is a fuse, so that the passage of an over-current through it causes it to blow. (paragraph 0009).

With regard to Claim 4, Maxwell JR. et al. discloses A safety circuit characterized in that each load has an FET protection switch associated to it, and each one of these switches has a dedicated temperature detector (column 10, lines 56 – 67 & column 11 lines 1 – 7).

> With regard to Claim 5, Maxwell JR. et al. discloses a safety circuit characterized in that various loads have a single associated FET protection switch, and the latter has a dedicated temperature detector. (column 2, lines 34 – 41 & lines 57 – 61). Maxwell Jr. et al. teaches that a controller is capable of controlling the current to at least one load through at least one solid state relay and that the switches temperature is measured at or around the switch. This can be interpreted to mean that one switch can be used to control various loads and that that switch as a dedicated temperature sensor.
>
> With regard to Claim 6, Frey et al. discloses a safety circuit, characterized in that said controlled safety switch is an electronic power switch. (paragraph 0030). Frey et al. teaches that the switch can be a thyristor, which is an electronic power switch. Frey et al. further teaches in figure 3 that a resistor (44) can be used as a safety switch to shunt current through the ground shunt line. The transistor is an electronic power switch as well.

Applicant respectfully traverses this rejection. The key to Applicants' invention is a safety circuit in an electrical system that protects components from over loads by monitoring the temperature of a solid state relay, determining if there is a temperature anomaly, determining if the anomaly is persistent, and if persistent short-circuiting the power supply to ground. Thus, Applicant's claimed invention makes provision for the safety circuit to determine the persistence of a temperature anomaly before shunting the power supply to ground.

A fair reading of Maxwell JR. et al. reference discloses a safety circuit in an electrical system that protects components form over loads by monitoring one of a group of parameters including current through the solid-state switch, the current through and voltage drop across the loads, and the temperature at or around the solid-state switch. However Maxwell JR. et al does not teach or suggest that once a predetermined level of the monitored parameter is reached it is monitored for persistence before shunting the power supply to ground. The reference does teach that in the case of energizing of a switch can cause a momentary exceeding of the current parameters and a delay is needed before such energizing surge so as not to cause a false positive reading. However, the reference clearly does not appreciate similar transitory anomalies in temperature causing a false positive.

A fair reading of Frey et al. reference discloses a power limiting circuit that monitors the temperature of a resistor in line with the load to determine if an over-current situation has occurred and causes a switch to shunt the power supply to ground. However, the Frey et al. reference does not teach or suggest how to determine if the temperature of the resistor is an anomaly or a persistent condition that requires shunting of the power supply to protect the circuit. Thus, this reference adds nothing to the Maxwell JR. et al. reference that discloses, teaches, or even suggests the ability to determine if a temperature rise above the preset safety level is an anomaly or a persistent condition requiring power shut down. Instead, these references teach that a power shut down is to be done as soon as a monitored condition passes a preset level.

Clearly, when viewed in this light the Maxwell JR. et al. reference, the Frey et al. reference, or any combination thereof, discloses, teaches, or suggests the use of a safety circuit that can determine and differentiate an anomaly condition from a persistent condition before activating the power supply shut down to the load as does Applicants' present invention.

Claims 7 and 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Maxwell JR. et al. in view of Frey et al. and further in view of Minami et al. (US2004/0027750). Specifically, the Examiner states:

> With regard to Claims 7 & 8, Maxwell JR. et al. in view of Frey et al. teach a safety circuit according to Claim 1 and further teach a controlled safety circuit that is a thyristor.
>
> Maxwell JR. et al. in view of Frey et al. does not teach that the controlled safety circuit is of the FET type or a relay. Minami et al., teaches a digital protection and control device. The device contains a switch that can be a thyristor, power FET or mechanical relay (paragraph 0339).
>
> It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Maxwell JR. et al., Frey et al. and Minami et al. by replacing the thyristor with a FET or mechanical relay for the purpose of ensuring that the safety switch can withstand the current flow through the shunt line.

Applicant respectfully traverses this rejection. The key to Applicants' invention is a safety circuit in an electrical system that protects components from over loads by monitoring the temperature of a solid state relay, determining if there is a temperature

anomaly, determining if the anomaly is persistent, and if persistent short-circuiting the power supply to ground. Thus, Applicant's claimed invention makes provision for the safety circuit to determine the persistence of a temperature anomaly before shunting the power supply to ground.

A fair reading of Maxwell JR. et al. reference discloses a safety circuit in an electrical system that protects components form over loads by monitoring one of a group of parameters including current through the solid-state switch, the current through and voltage drop across the loads, and the temperature at or around the solid-state switch. However Maxwell JR. et al does not teach or suggest that once a predetermined level of the monitored parameter is reached it is monitored for persistence before shunting the power supply to ground. The reference does teach that in the case of energizing of a switch can cause a momentary exceeding of the current parameters and a delay is needed before such energizing surge so as not to cause a false positive reading. However, the reference clearly does not appreciate similar transitory anomalies in temperature causing a false positive.

A fair reading of Frey et al. reference discloses a power limiting circuit that monitors the temperature of a resistor in line with the load to determine if an over-current situation has occurred and causes a switch to shunt the power supply to ground. However, the Frey et al. reference does not teach or suggest how to determine if the temperature of the resistor is an anomaly or a persistent condition that requires shunting of the power supply to protect the circuit. Thus, this reference adds nothing to the Maxwell JR. et al. reference that discloses, teaches, or even suggests the ability to determine if a temperature rise above the preset safety level is an anomaly or a persistent condition requiring power shut down. Instead, these references teach that a power shut down is to be done as soon as a monitored condition passes a preset level.

A fair reading of Minami et al. reference discloses a digital protection and control device that may utilize a static thyristor or power FET in place of a mechanical power relay. However, Minami et al. does not direct itself to protecting a load from a damaging power overload, but instead to preventing data bus overload of data due to unbalanced communication loads. Clearly, this reference does not disclose, teach, or suggest how to determine if a temperature over a preset level is an anomaly or a persistent condition requiring shunting to the power supply to ground to protect the load.

Appl. No.: 10/707,642
Amdt. Dated: 10/18/2005
Reply to Office action of: 09/22/2005

Clearly, when viewed in this light the Maxwell JR. et al. reference, the Frey et al. reference, the Minami et al. reference, or any combination thereof, discloses, teaches, or suggests the use of safety circuit that can determine and differentiate an anomaly condition from a persistent condition before activating the power supply shut down to the load of Applicants' present invention.

In view of the remarks herein, and the amendments hereto, it is submitted that this application is in condition for allowance, and such action and issuance of a timely Notice of Allowance is respectfully solicited.

Respectfully submitted,

Bruce E Harang

Bruce E. Harang
Registration No. 29,720
Tel.: (360) 903-4693